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Viability Of Red Pine Seed Stored Up To 54 Years

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ABSTRACT.—Reports that only 3 to 8 percent of red pine seeds were still viable after 50 to 54 years of storage.

KEY WORDS: Germination, conifer seed, seed storage.

Red pine (*Pinus resinosa* Ait.) is one of the most widely planted of the 41 species of pine native to the United States. Good seed crops are produced only once or twice a decade, so nursery seedling procedures must rely on stored seed (Rudolf 1990). Seeds apparently can remain viable for long periods of time when properly stored. In this paper we report the results of periodic germination tests on seeds put in storage more than half a century ago.

METHODS

In 1930, C.G. Bates, of the Lake States Forest Experiment Station, began a study to test the viability of red pine seed stored under different temperature regimes over time. He used seeds that had been collected in northeastern Wisconsin in 1928 and stored in a cask in a moderately cool place (Roe 1940). The seeds had been placed in small glass bottles and sealed with wax to minimize moisture change. They had then been placed in a larger jar and sealed. Storage treatments began in March and April 1930 under the following conditions:

1. Cold room at 32° to 39°F.
2. Cold room at 41° to 50°F.
3. Underground cellar at 32° to 68°F.
4. Seedhouse attic at 0° to 100°F.

Germination was tested in 1930, 1936, 1940, and 1958 (Roe 1940, Clausen and Rudolf 1958, Rudolf and Clausen 1962). It was tested again in 1982 after 54 years of storage. One hundred and fifty seeds from cold storage and cellar lots were placed on moist germination pads in a petri dish and kept in a germinator at about 70°F for 40 days. Seeds originally stored in the attic apparently had been discarded because very few had germinated in 1958. Seeds were considered germinated when the radicle length equaled or exceeded the seed length. We also tested seeds from vials that had been opened for previous tests and not resealed.

RESULTS AND DISCUSSION

Ten years of storage did not decrease the viability of seeds stored in the cold room (table 1). However, only half of seeds stored in the cellar and about one-third of those stored in the attic germinated (Roe 1940).

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Table 1.—*Percent of red pine seed germination (1930-1982)*

Treatment	Temperature range	1930	1936	1940	1958	1959	1982
Cold room	32° - 39°F[1]	95	95	97	10	8	0
Cold room	41° - 50°F[1]	95	91	75	—	—	—
Cellar	32° - 68°F	95	90	47	11	1	3
Attic	0° - 100°F	95	62	36	1	<1	([2])

[1] Cold-room seeds combined and put in 36°F storage in 1955.
[2] Seed vials not found.

After 29 years in storage, about 10 percent of seeds stored in the cold room and cellar, but less than 1 percent of those stored in the attic, germinated. The accelerated loss in viability of seed stored in the cold room may have been caused in part by the high temperatures that occurred when refrigeration equipment broke down several times (Clausen and Rudolf 1958, Rudolf and Clausen 1962). All seeds in the 32° to 39°F cold room treatment have been stored at about 36°F since 1955.

Other researchers found that 82 percent of slash pine (*Pinus elliottii* Engelm.) and 50 percent of shortleaf pine (*Pinus echinata* Mill.) germinated after 35 years in cold, dry storage (Wakeley and Barnett 1968).

After 54 years, seeds from vials stored in the cold room did not germinate, nor did seeds in vials opened for previous tests (table 1). Six (3 percent) of the seeds stored in the cellar germinated. Cutting tests showed that 98 percent of the ungerminated seeds were filled.

The six germinated seeds were planted in the greenhouse. Two grew to about 10 inches tall, and one died shortly after shedding its seed coat. The remaining three that germinated did not grow.

We also tested red pine seeds collected in 1933 at Itasca State Park. In 1982, 8 percent of this collection germinated, and 90 percent of the ungerminated seeds were filled. The 12 germinated seeds from this test were planted in the greenhouse. Two trees were outplanted in spring 1982, and were still living in 1990.

CONCLUSION

Red pine seed in cold storage remained highly viable for at least 10 years; however, germination decreased to about 10 percent after 30 years and to only 3 to 8 percent after 54 years.

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